A Biosystematic View of Civilizations: Western Europe and Japan Before and After the Industrial Revolution

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Abstract

Civilization may be regarded as a biosystem. The relationship between the roles of civilization and its building blocks in relation to the environment is analogous to other biosystems at different hierarchical levels (a biosystematic view of civilization). Recently, a conceptual view of history was translated into English as An Ecological View of History: Japanese Civilization in the World Context. Its method was successfully adapted to comparative studies of civilizations in the Eurasian continent. However, this approach has not yet been applied to the evaluation of New World civilizations.

Here, we consider the evaluation of the behavior and structure of civilizations in the New World. The analysis describes the parallel behaviors of Western Europe and Japan around the time of the Industrial Revolution.

Introduction

The idea that history can be evaluated from the standpoint of natural science is not readily accepted, for history itself is traditionally discussed from the viewpoints of the humanities and the social sciences. Yet is it not evident that human societies can be treated as adaptive units? We can begin by asserting that group selection is a basic aspect of evolution. Many analyze human history through the lenses of such academic fields as the humanities, history, social sciences, and anthropology. But let us consider the principles of evolution. We can define civilization by extrapolating from human cultures and cultures may be evaluated in relation to Darwinian adaptation. Some scholars have attempted to draw the characteristics of civilizations from the viewpoint of systems research and from the viewpoint of the interaction between society and nature.

I would like to draw your attention to the fact that an Eastern scientist attempted to explain the evaluation of history as a natural phenomenon more than half a century ago. Tadao Umesao proposed an ecological view of history in 1957 for the first time. The approach he proposed is not been well recognized by Western scholars in social sciences, history, and anthropology, even though the work has now been translated into English.

The idea was that Eurasian history can be primarily evaluated based on the principle of ecology. There are parallels between the history and modernization of Western Europe and that of Japan, just as there are parallel historical phenomena among other societies such as...
China, India, Arabia, and Russia. Clearly, we can adapt the principles of ecological succession and parallel evolution in biology to the behavior of human history.

Umesao comparatively evaluated Japanese civilization as a system along with Western European civilizations. He divided Eurasian civilizations into two groups, as shown in his original conceptual illustration (Figure 1). Is this hypothesis oversimplified?

![Figure 1. Classification of the civilizations in Eurasia proposed by Umesao in 1957](image)

He classified Western Europe and Japan as Area 1, and the other civilizations on the Eurasian continent (Arabia, India, Russia, China, Eastern Europe, and Southeast Asia) he categorized as Area 2.

In the past, many have written of a parallel history between Western Europe and Japan. However, via Umesao’s method, we can clarify the behaviors and the differences between the two groups by demonstrating why Japan modernized at the same time as Western Europe. Why? The differences between the two groups of civilizations are mainly attributable to the ecological and geological locations of the groups on the Eurasian continent.

Umesao did not apply his method to the New World; indeed, he mentioned not having an idea of how the New World should be evaluated via his ecological theories. Thus, the evaluation of civilizations in the New World—such as North America, South America, Australia, and New Zealand—mounts an interesting academic challenge.

I have attempted to develop a unified theory that describes the behavior of biosystems at different hierarchical levels such as chemical evolution, prokaryotes (unicellular), eukaryotes (multicellular), social insects, ecosystems, and civilizations. One can easily deduce the principle of the theory by observing the roles of a biosystem and its building blocks in relation to their environment. The building blocks in a biosystem do not tend to interact directly with the environment. The biosystem itself relates to the environment (Figure 2).
The theory successfully demonstrates the unique properties of biosystems at different hierarchical levels; this principle constitutes the biosystematic view of civilization (BVC).\textsuperscript{25} Furthermore, the principle of the BVC may be applied to the description of the behaviors of civilizations.

The biosystematic view of civilization is ecological, an extension of the idea that we may look at civilizations ecologically; both the biosystematic view and the ecological view see civilization as a system. The idea that civilization can be evaluated as a system\textsuperscript{26, 27} since groups of organisms at higher hierarchical levels can be evaluated as an organism\textsuperscript{1,28,29} is actually not new. We all know that groups of organisms at higher hierarchical levels such as social insects can be evaluated as organisms themselves. Looking at civilization from a biosystematics point of view and from an environmental point of view, we observe analogies and differences among biosystems at different hierarchical levels. Principally, the latter applies more widely to different biosystems since biosystematics views derive from wider-ranging observations of biosystems than an ecological view, which focuses merely on civilizations and human societies.

Let us evaluate civilizations in the New World and deduce the parallel emergence of hierarchical levels among civilizations in relation to Western Europe and Japan, using systematic theory.

A Reevaluation of the Ecological View of History in Relation to the Industrial Revolution

The ecological view of history builds upon the observation of parallelism in the histories of Western Europe and Japan, and of Arabia, India, China, Russia, Eastern Europe, and Southeast Asia. This contrasts with the idea that cultures would involve characteristics formed by the evolutionary adaptation of human societies\textsuperscript{30, 31} since the ecological view rests on applying succession theory in plant ecology to human history.\textsuperscript{32, 33}
We may classify Old World civilizations — including the Eurasian continent and the part of North Africa bordering the Mediterranean Sea — into two: Area 1 includes Western Europe and Japan, which are far from the center of the Eurasian continent, and Area 2 includes all other civilizations and societies of the Eurasian continent.

The parallelism within the civilizations in Areas 1 and 2 -- and the differences between the civilizations in Areas 1 and 2 -- arises when we take the view that the history of these civilizations can be evaluated from an ecological viewpoint. Note that the Eurasian continent and North Africa are an oval area in which the arid region extends from the northeast to the southwest (Figure 1). The ecologically important factor is that the civilizations in Area 2 directly face the arid region; the civilizations in Area 1, however, are far from the arid region.

That is why Umesao concluded that this factor was a central cause of the different patterns of history in Areas 1 and 2. He deduced it by using an analogy, the succession of ecosystems. The civilizations in Area 1 developed gradually since Area 1 is very far from the arid region; thus, attacks on the civilizations in Area 1 by the peoples of the arid region were not fatal (Figure 3, top).

We may note that Asian societies in Area 1 experienced several gradual transformations: an ancient kingdom, feudalism, absolute monarchy, and the people’s revolution.\(^{34, 35}\) The continuous institutional changes in Japan have been pointed out by Western scholars as well.\(^{17,18,36-38, 39}\) Although Western science and technology after the Age of Discovery and

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**Figure 3.** Simplified model of the transformation of society in Area 1 and Area 2 on the Eurasian continent according to an ecological view of history by Umesao. Top indicates smooth transformation of society in Area 1 and Bottom indicates that the societies in Area 2 did not experience smooth transformation.
before the Meiji Restoration were continuously transferred into Japan, the spontaneous development of social systems and institutions by Japan itself was a necessary factor for modernization. During the spontaneous transformation of the social system, colonialism and the Industrial Revolution occurred. These transformations produced an accumulation of wealth, social capital, infrastructure, and technology. In other words, the parallelism of the histories in Area 1 is primarily attributable to the similar ecological circumstances in these areas.

In contrast, the peoples in the arid region repeatedly destroyed all the ancient civilizations in Area 2, even though these ancient civilizations had originally emerged in Area 2 (Figure 3, bottom). Indeed, the civilizations in Area 2 did not experience the Industrial Revolution until very recently. On the contrary, the industrial revolution began in the United Kingdom and spread out smoothly to USA, other Western European countries, and Japan a few decades later. This is because the civilizations in Area 2 did not smoothly experience spontaneous transformation from the ancient civilizations.

We may consider the spontaneous transformation in Area 1 to have been the main driving force that determined the histories of Area 1. Modernization is but an extrapolation of the spontaneous transformations of civilization.13

Although there are obvious minor differences between Western Europe and Japan, the parallel histories of Western Europe and Japan are evident. For instance, take the extension of colonization from the 16th to the 19th century. Japan colonized Southeast Asia around the middle of the sixteenth century, and it ended the colonization of Southeast Asia at the beginning of the seventeenth century. During that time, one hundred thousand Japanese people traveled to Southeast Asia.39 Japan’s national isolation occurred at the beginning of the seventeenth century. This substantially delayed the accumulation of wealth in Japan during the seventeenth through nineteenth centuries.

By contrast, the accumulation of wealth accelerated during the Industrial Revolution in Western Europe. Although the Industrial Revolution in fact started in Western Europe, Japan might have had an Industrial Revolution on its own if Western Europe had not developed.38, 40, 43

Ecological historians can discern the parallel historical behaviors of civilizations — especially up until the modernization of Western Europe and Japan — by observing that the ecosystems of those civilizations were substantially important factors until the Industrial Revolution (Figure 4). In other words, the environmental perspective of history is limited in describing the behavior of civilizations after the Industrial Revolution and in the New World. The importance of a civilization’s ecosystem becomes relatively weak after the Industrial Revolution. In addition, the principle of ecosystems does not readily apply to the behaviors of civilizations after the Industrial Revolution.
Factors, which determine the behavior of a civilization, consisting of the inherent nature of the civilization, the interaction with the environment, and the interaction with other civilizations and societies.

Thus, because a civilization can be regarded as a biosystem, the biosystematics approach helps explain the behavior of civilizations.

The Principle of the Biosystematic View of civilization (BVC)

If we can agree on a definition of civilization, we may proceed to analyze the structure and function of civilizations.

There are several definitions of civilization, including the idea that civilization is an extrapolation of human cultures. Civilization is also sometimes evaluated as an organism or system. As readers know, however, there is little agreement on the actual meaning of the terms civilization and culture. According to Umesao, civilization is a system that includes human beings as well as instruments, technologies, and social systems. In addition, he defines the cultures of a civilization as the relationships amongst individuals, institutions, and so on within the civilization.

On the other hand, based on the comparative analysis of biosystems at different hierarchical levels, I deduced in a previous paper that a civilization corresponds to a biosystem, and the cultures in the civilization constitute the assignment between information and function developed by humans. The term “assignment” used here was extrapolated from the term of “assignment” between genotype and phenotype of molecular biology.
The importance of hierarchical levels in organisms is frequently pointed out. So, based on this analysis, we may define civilization as a biosystem in which there is a hierarchy of individual humans as the building blocks of the civilization. This definition reflects a trend in modern society wherein individual humans in civilization do not interact directly with their environments. I would note that the biosystematic principle of historical analysis is based on the importance of the relationship between a biosystem and its environment, and this assumption is consistent with conventional principle regarding the importance of the environment for organisms. This trend resembles the relationship between the system and its building blocks.

Furthermore, the trend of humans interacting indirectly with environments through civilization becomes clearer when the civilization has experienced an industrial revolution. Naturally, the role of civilization as an upper-hierarchical level for humans would not exist in a non-civilized society.

This definition contrasts with the conventional view of civilization; that view is that civilization arises as an extrapolation of human cultures. The presence of boundaries supports the analogies among these biosystems as well as the requisites for lifelike systems.

The requisites for a biosystem include the following: metabolism (Requisite I); self-reproduction (Requisite II), although it is sometimes said that cultures are unlikely to self-reproduce; mutation (Requisite III); assignment between information and function (Requisite IV); and individuality and stability (Requisite V). Civilization—especially after the Industrial Revolution—satisfies these requisites.

According to a biosystematics approach, the behavior of a civilization, as illustrated in Figure 4, rests on the following three factors:

- the inherent nature of a civilization as a biosystem (Factor 1),
- the interaction of a civilization with the environment (Factor 2), and
- the interaction of a civilization with other civilizations and societies (Factor 3)

This model is similar to the evaluation of an organism in the environment and of chemical phenomena.

Civilizations in the New World

Let us define “New-World Civilizations” -- North America, South America, Australia, and South Africa -- as Area 3 in the present paper. We should ignore for the time being ancient civilizations that emerged in Central to South America or Central Africa. In other words, the societies and civilizations of Area 3 were more or less isolated from the civilizations formed in Areas 1 and 2 until the Age of Discovery and colonialism. Naturally, isolation is an important factor in determining the behaviors of human societies in relation to Factor 3.
The characteristics of the present civilization in Area 3 after colonization may be evaluated by applying Factors 1 through 3.

For Factor 1, regarding the inherent nature of civilization, let us classify the civilizations in Area 3 into two types. Some civilizations in Area 3 such as North America and Australia experienced industrial evolution simultaneously with the civilizations in Area 1 up until the end of the nineteenth century. Industrial revolution in the civilizations in Area 1 synchronizes with the transplant of the civilizations of Area 1 to Area 3. However, some societies in Area 3 such as Central America and South America did not experience industrial revolution.

Thus, the civilizations at present in Area 3 might be also classed together into two groups based on whether they experienced industrial revolution simultaneously with Area 1. If we divide the civilizations in Area 3 into two groups, one involves the civilizations that experienced industrial revolution, and the other involves those that did not experience it. These trends relate to the origins of the civilizations in Area 3. The civilizations in Central and South America, for instance, came mainly from Spain and Portugal. There is no evidence that Spain and Portugal had experienced spontaneous transformation through feudalism and absolute monarchy; their suzerains were strongly influenced by Islamic civilizations. On the other hand, the civilizations of North America and Australia came mainly from England and partly from the Netherlands, and France. The original civilizations in Area 1 experienced spontaneous transformation through feudalism and absolute monarchy before and after colonialism.

Regarding Factor 2, the ecological environments of the civilizations in the New World in Area 3 (the first group above) are generally temperate climates, and those in the rest of Area 3 are tropical-to-temperate climates.

For Factor 3, the present civilizations in Area 3 are still geographically isolated from Areas 1 and 2. Thus, the interaction of a civilization in Area 3 with Areas 1 or 2 is geographically weak. However, the influence of geographical isolation decreases in the face of technological innovation.

The Stages of Civilizations and Societies Classified According to Interaction with the Environment

Since the strength of the interaction between a civilization and its environment is notably different before and after industrial revolution, one may profitably classify civilizations into two stages—before (Stage 1) and after (Stage 2) industrial revolution. This becomes significant when we observe the impact on society of natural disasters before and after the Industrial Revolution in Area 1. For instance, during the eighteenth and nineteenth centuries in Japan, famines caused hundreds of thousands of deaths. Such famines have not emerged...
since the Japanese industrial revolution. This suggests that the improvement of the civilization decreases the influence of the environment on the civilization.

Such trends are useful for classifying the stages of human societies. The interactions of civilized and non-civilized societies with the environment are notably different; humans in non-civilized societies interact directly with the environment, and the humans and its society are merely building blocks of a surrounding ecosystem.

We can classify societies and civilizations into three stages, based on the interaction between society and the environment. Non-civilized societies are Stage 0, civilizations before the industrial revolution are Stage 1, and those after the revolution are Stage 2. Thus, all human societies past and present resolve into nine types: Areas 1, 2, and 3 at Stages 0, 1, and 2 (Figure 5 and Figure 6).

![Figure 5](image)

Figure 5. Classification of the societies and civilizations present and past

Certain classes, such as Stages 0 and 1 in Area 1, have already disappeared, have been incorporated into present civilizations, or were found to transform into a different stage. For instance, there are neither non-civilized societies nor civilizations at Stage 1 in Area 1. Some non-civilized societies are isolated from other civilizations and still maintain traditional social styles. Figure 6 indicates the civilizations with the above classifications in simplified continents at present. Areas 1 and 2 are drawn on the basis of an the ecological view of history, and Area 3 includes North America, Central America, South America, Australia, New Zealand, Africa, Hawaii, and Hokkaido.

Natural environments include solar energy, the location of the civilization or societies, geographical features, the distribution of continent and ocean, and disasters emanating from the earth’s interior (such as earthquakes and volcanoes). The stability of the civilization or society regarding these natural perturbations increases in the order of Stage 0 < Stage 1 < Stage 2 (Figure 7).
Let us consider the societies at Stage 0 as systems that have a minimum consumption of materials and energy from the environment. Although several societies at Stage 0 possess technology, cultivation, and pastoralism, the surplus is not sufficient to form civilizations. Thus, the society is strongly dependent on the natural environment. Many societies in the past have disappeared following climate change or natural disaster. From this viewpoint, the relationship between a society at Stage 0 and the environment is similar to that of a society composed of earlier representatives of the family of man and the environment.

Stage 1 civilizations, although they possess a notable surplus compared to societies at Stage 0, are mostly dependent on large-scale irrigated agriculture and pastoralism where the primary energy source is solar energy. The continuity of the large civilizations in Area 2 at Stage 1—such as Arabic, Indian, and Chinese civilizations—from the emergence of these civilizations to the present indicates that these civilizations are stable for long periods against climate change and/or natural disasters. The surplus acts as energy and materials to maintain the civilization, and the extensive area, including the large population, stores the information necessary for the civilization. Such civilizations are, therefore, more stable than non-civilized systems against environmental changes.

Civilizations at Stage 2 have more independence from environmental changes than those at Stage 1. In other words, Stage 2 civilizations are strongly autonomous systems. This autonomy is supported and protected by several factor such as the consumption of fossil fuels, natural resources, and technologies, that are not adopted by Stage 1 civilizations (Figure 7).

We may cite statistics such as primary energy consumption, level of education, and GDP to support the importance of a difference between civilizations before and after industrial revolution. For instance, the disappearance of Chilean nitrate and Peruvian guano in the early twentieth century was overcome by ammonium manufacturing — that is, the Haber-
Bosch method.\textsuperscript{55-57} Many chemical industries today are maintained by fossil fuels.\textsuperscript{56} This does not necessarily mean that a civilization at Stage 2 is totally independent of its environmental ecosystems; natural disasters frequently destroy highly modernized civilizations.\textsuperscript{58} So while it is mostly true that civilizations at Stages 1 and 2 develop inventions that enhance independence from the environment, the trend at Stage 2 is clearer than it is at Stage 1.

The great difference in average energy consumption between Stages 1 and 2 becomes obvious when the civilizations in Areas 1 and 2 are compared.\textsuperscript{53, 54} For Stage 2 civilizations, fossil energy and its substitutions maintain the civilization. The energy consumed by humans maintains the civilization’s autonomy against environmental fluctuations and feeds the individual humans as living organisms. This phenomenon shows that agriculture and pastoralism at Stage 2 are strongly dependent on fossil fuels rather than solar energy. This also shows that the nature of Stage 2 civilization is quite different from that of Stage 1 civilization. Naturally, a part of the energy consumed in a Stage 1 civilization maintains civilization itself, although the contribution of total energy is much smaller than that of Stage 2 (Figure 7). Using excess energy and materials to maintain civilization itself is a significant characteristic of Stage 2 civilizations. One might even maintain justly that having a surplus in both Stage 1 and Stage 2 civilizations maintains the civilization itself and is a useful tool for distinguishing between civilized and non-civilized societies (Figure 7).

The characteristic of Stage 2 civilizations -- being more independent of the environment than those at Stage 1 -- synchronizes with the trend of individual humans not directly interacting with their environments. Once the civilization has experienced industrial revolution, this becomes clearer. While energy consumption in Stage 2 comes principally...
from fossil fuels, the energy consumption used for the metabolism of individual humans as living organisms—that is, food—is indirectly provided through the machinery, equipment, and transportation used to maintain the civilization.

In other words, the necessities for individual humans as organisms—such as food and water—in Stage 2 civilizations are regularly provided through the systems of the civilization. Stage 2 civilizations behave as autonomous systems relatively independent of environmental changes. This coincides with the trend of individual humans involving behaviors as the building blocks of the civilization.25

**From the Dynamics of Ecosystems to the Dynamics of a System Consisting of Civilizations**

The importance of each factor mentioned above for determining the behaviors of civilizations past and present depends on whether the civilization is classified at Stage 0, 1, or 2 and is located in Area 1, 2, or 3. What are the characteristics of these factors and the spontaneous transformations of the stages?

Factor 1, regarding the inherent nature of civilization, derives from the fact that a biosystem possesses inherent characteristics. Biosystems—such as prokaryotes, archaea, eukaryotes, ecosystems, and social insects—possess different inherent characteristics.25 Analogous to these biosystems, we may deduce, is that civilization should possess inherent characteristics.

First, some begin by assuming that it is required to have humans as building blocks for civilization to determine the inherent nature of civilization. For instance, apes and even fossil human species could not construct a civilization. Hypothetically, intelligent organisms on a planet could build different types of civilizations where the intelligent organisms behave as building blocks for their civilization. The inherent nature of civilization is independent of race and ethnicity, since it is primarily dependent on the ecological environment and geography.13 However, the inherent nature of the civilizations in relation to the people in Areas 1, 2, and 3 and at Stages 1, 2, and 3 will be an important issue in the future. Here I only wish to point out that the common characteristics of Stage 2 civilizations are great energy consumption, high technology, and several social systems, as compared to Stage 1 civilizations.

In addition, the consumption of Stage 0 societies is much smaller than that of Stage 1 and Stage 2 societies.

Regarding Factor 2—the relationship between civilization and the environment—natural environments affect civilizations and societies differently. This is analogous to the way organisms interact with their abiotic and biotic environments.59 As described earlier, Stage 2 civilizations are becoming independent of environmental changes and events. The historical change regarding the interaction between a civilization and the environment and between a civilization and other civilizations is illustrated in Figure 8. The black solid in
Figure 8 indicate the interactions between civilizations and the environment, and the gray dashed arrows indicate the interactions among civilizations. The influence of the environment has become relatively small over human history.

Regarding Factor 3, behavior and history arise from the interactions among civilizations and societies. Interactions among societies and civilizations are important for analyzing the behavior of civilizations. Naturally, important events in history regarding such interactions are simplified for heuristic purposes. In addition, there are several phenomena in which civilizations and societies affect each other mutually. Interactions among the major and local civilizations on the planet are indispensable to each civilization; interactions have grown gradually over the course of history.

First, ancient large-scale civilizations appeared almost independently on the Eurasian continent (Figure 8a). At the beginning of history, interactions between civilizations were not strong, and trade and human exchange grew gradually since the population was much smaller than today. Second, the non-civilized societies in Area 1 became civilized societies by copying the systems of the civilizations that originally emerged in Area 2 (Figure 8a). The copying of the original ancient civilizations occurred not only in Area 1, but also in the remote regions of Area 2.

Third, the civilizations in Area 2 were strongly affected by the societies in the arid region until the early modern age (around the time of colonialism). See Figures 8b and 8c. On the other hand, the influence of the societies in the arid region did not reach to Area 1 although they sometimes overran Western Europe.

Fourth, after colonialism, the civilizations in Area 2 interacted with those civilizations at Stage 2 in Area 1 which were primarily maintained by civilizations in Area 1 (Figure 8d). Finally, most of the former colonies in Area 2 are no longer controlled by Area 1. On the
other hand, the indigenous societies in Area 3 either were incorporated into the system of Area 1 civilizations or were destroyed by invaders from Area 1. The rapid growth of several developing countries at the end of the twentieth century indicates that societies in Areas 2 and 3 at Stages 0 and 1 are transitioning to Stage 2 by transplanting technologies and social systems the appeared in Stage 2 civilizations.

**Figure 8.** (Continued)
The Emergence of Hierarchical Levels Among Civilizations

The relationships among civilizations and societies become domination and equilibrium—in other words, competition and cooperation. Here, domination means the phenomenon of hierarchical levels forming between societies, unless the dominated society is destroyed. The spontaneous emergence of hierarchical levels and the complexity of organisms are regarded as general phenomena in biota.\textsuperscript{61-63} Although it is obvious that hierarchical levels among humans appear within civilizations at any Area and Stage, the emergence of hierarchical levels between civilizations and societies is a focus here since civilization is considered as a biosystem.

The domination of Area 2 civilizations by Area 1 civilizations during colonialism is an example of the emergence of hierarchical levels. This phenomenon resembles the emergence of hierarchical levels appearing between herbivorous and carnivorous animals by adaptive radiation in long-term evolution, although it is very controversial. The formation of hierarchical levels of organisms is primarily due to interactions among organisms. Similarly, hierarchical levels emerge spontaneously among civilizations by the interactions among civilizations (Figure 9). The domination of one civilization by another is usually achieved through military force that emanates from the dominating civilization.

Because Stage 2 civilizations are more independent of the environment, the influence of Factor 2 becomes relatively weak compared to Factors 1 and 3. We postulate, therefore, that at Stage 2 the inherent nature of the civilization (Factor 1) and the influence of the relationship between the civilization and other civilizations (Factor 3) become more important in determining the behavior of the civilization than Factor 2.

North America as a Civilization

Stage 2 civilizations in Areas 1 and 3 such as Western Europe, Japan, and North America are normally maintained by energy sources from fossil fuels. These civilizations are relatively unleashed from constraints imposed by their environments. Applying the analogy between the behaviors of civilization and living organisms, the domination and equilibrium
regarding Factor 3 would be important in determining the relationships among civilizations (Figure 9).

North American civilization, which was a copy of Western European civilization, started extensive colonization around the beginning of the seventeenth century. The civilization of the New World was established by continuous immigration and maintained by the continuous development of the frontiers required for the construction of the civilization, including cities, farms, factories, and military; also, it more or less obliterated the history of the indigenous people. The expansion of North American civilization by military force maintained the civilization; it is a fact that Area 1 civilizations tend to expand and incorporate other societies.

North American civilization has become a civilization of the highest hierarchical level. Its concentration of wealth, human resources, production, intellectual property, and military force supports this assumption. How concentration and unilateral flow occur is not important, but the presence of concentration and unilateral flow is important from the biosystematic view of civilization. This phenomenon resembles the formation of hierarchical levels between the societies of Mongolian pastoralism and the surrounding civilizations such as China, Arabia, India, and Russia, during the Middle Ages. In addition, the colonization of Area 2 by the civilizations in Area 1 led to the formation of hierarchical levels among the civilizations. These facts indicate that the emergence of hierarchical levels among civilizations and societies constitute spontaneous phenomena regarding history as a natural phenomenon (Figure 9).

We evaluate the question of why North America settled at the highest hierarchical level from a biosystematics view of history. Military force is one of the most important factors in producing hierarchy. The prosperity of Mongolia in the Middle Ages supports this assumption. In this, human history is analogous to other biosystems, with their hierarchies, such as the food chain, in which carnivorous animals possess much more physical strength than herbivorous animals. The number of civilizations located at higher hierarchical levels may be determined by the size of the earth, population, and geographical conditions. This assumption follows from the fact that the number of hierarchical levels in the food chain structure is dependent on the size of the ecosystem. If the earth were larger, the hierarchical complexity would be greater. This is analogous to the differences between the sizes and complexity of the ecosystems in Eurasia and Australia. It indicates that the complexity of the whole ecosystem on a continent would increase if the size of the continent increased. If this rule can be applied to the behavior of civilizations, the complexity of the relationship among civilizations and societies would be determined primarily by the size of the ecosystem, that is, ultimately, the size of the earth.
Analogy Between Hokkaido for Japan and North America for Western Europe from the Early Modern to the Modern Periods

The parallel histories of Area 1 at the west and east ends of Eurasia—that is, Western Europe and Japan—include developments during ancient society, feudal society, absolute monarchy, colonialism, and the Industrial Revolution. The colonization of Area 2 by both Western Europe and Japan started at the beginning of the sixteenth century in parallel. The colonization by Western civilizations in Area 1 expanded to Areas 2 and 3. It is generally considered, however, that Japan suddenly quit colonization and entered into seclusion in the early seventeenth century while Britain and other Western countries continued to manage colonies in India, Southeast Asia, and North America. The colonization of Area 2 by Japan started again at the end of the nineteenth century, as national isolation subsided.

We see a parallel phenomenon regarding the colonization of societies in Area 3 by Japan. The indigenous societies in North America, Australia, and New Zealand in Area 3 were absorbed by Western European civilizations. The Japanese incorporation of the indigenous society of Ainus in Hokkaido, which is now part of Japan, started in earnest at the beginning of the seventeenth century. This colonization was mainly a result of Tokugawa absolutism, which would also be regarded as an extrapolation of the continuous expansion of Japan toward the northern area of the Japanese islands from around the eighth century (Figure 10). Although Japan quit the colonization of Southeast Asia in 1639, it did not release the substantial colonies in the Ryukyu Islands and on Hokkaido. The colonization in the seventeenth and nineteenth centuries occurred under the absolute monarchy of Tokugawa Bakufu. Hokkaido was a frontier for Japan at the beginning of the seventeenth century, which was the era of absolute monarchy in both Japan and Western Europe. Finally, Hokkaido and the Ryukus were incorporated into Japan until the end of the nineteenth century. Before the seventeenth century, the Ryukyu were an independent country, and Hokkaido was the land of the Ainu people. Thus, the situation of Hokkaido and the Ryukus after the seventeenth century, occupied by Japan, was very similar to that of societies in India, Southeast Asia, North America, and South America that were all occupied by Western civilizations.

Hokkaido is located along the northern boundary of Japan, but it is not considered to constitute a society categorized in Area 2. The Ainu people were not influenced by the civilizations in Area 2 and had not enough experience to build even an ancient style of kingdom. This is different from other societies in the Far East and Southeast Asia such as Korea, Thailand, the Ryukyu, and Vietnam. Korea and Ryukyu had built ancient-style civilizations, mostly copied from Chinese civilization, especially regarding the political system based on the Ritsuryo codes; it is noteworthy that some civilizations in Southeast Asia have been influenced by the civilizations of both India and China.

From this viewpoint, the situation of indigenous people in Hokkaido is different. The society of Ainu would be similar to that of the Native American people in North America, although
there are obvious geographical differences between Hokkaido and North America. The area of Hokkaido faces Japan’s Honshu island, which is categorized in Area 1; only a short strait of about 20 kilometers separate the two, while the distance between Western Europe and North America reaches over 5,000 kilometers; the distance between Tokyo and Hokkaido is roughly 900 kilometers, and the distance between London and New York is 5,500 kilometers. Second, the area of Hokkaido is notably smaller than that of the North American continent. The area of Hokkaido is 0.08 million km$^2$; the area of the North American continent is 25 million km$^2$. However, according to the definition of Area 3, which we may categorize as neither Area 1 nor Area 2, the location and the size of Area 3 do not matter.

Neither North America nor Hokkaido were influenced by the civilizations that emerged in Area 2 before these were affected by the civilizations in Area 1. The influence on these areas by Area 1 civilizations was indeed very weak until the beginning of the seventeenth century. This indicates that both Hokkaido and North America should be considered as Area 3 from the viewpoint of the relationship between the indigenous people and the civilization of Area 1. On the other hand, Ryukyu should be categorized as a civilization in Area 2, along with Korea and Southeast Asia.

The invasion and occupation of Hokkaido by Japan from the early-modern period to the modern period is comparable to the invasion of North America, Australia, and New Zealand by Western Europe (Figure 10).

**Figure 10.** Parallel phenomena between the New World for Western Europe and Hokkaido for Japan
First, Area 3 experienced industrial revolution simultaneously with Area 1 until the end of the nineteenth century. South America, however, had not experienced industrial revolution until the end of the nineteenth century. North America obtained modernity through the Industrial Revolution following the absolute monarchy of Britain. Similarly, Hokkaido was modernized as a part of Japan through industrial revolution up until the end of the nineteenth century.

Second, in these areas, the hierarchical structures for the society of the indigenous people and that of the invader are analogous. From this viewpoint, the invasion of Hokkaido by Japan parallels events in Western Europe. The similarities of the hierarchical levels—that is, the formation of colonization—that emerged at the similar age and situation of the societies of indigenous people in Area 3 forced by Area 1 are clear.

We should point out the following differences between the New World and Hokkaido: North America, Australia, and New Zealand in New World became independent countries from Britain in the eighteenth to the twentieth centuries, and Hokkaido remains a part of Japan. Although the USA, Canada, Australia, and New Zealand are independent from the suzerain, these countries still possess strong interactions with the original suzerain. For instance, the monarch of Britain is also the monarch of Canada, Australia, and New Zealand.

These facts suggest that the differences between Hokkaido for Japan and the New World for Western Europe just reflect variations: the interactions between the newly developed civilizations in Area 3 and the civilizations in Area 1 are in a broad spectrum. The interactions would be dependent on the inherent nature of the civilizations in Area 1 and the societies in Area 3, the distance between Area 1 and Area 3, the size of the civilizations in Area 1, and so forth.

To analyze the differences between North America and Hokkaido let us apply three factors. About Factor 1, concerning the inherent nature of civilization, the fundamental cultures and humans as building blocks of the civilizations are different in Japan and Western Europe. The aspects of culture—including agriculture, politics, military, and education—that laid the groundwork for the growth of modern civilization in the social system, technologies, and cultures of Hokkaido, were primarily transported from Japan, although some modern technologies were transferred from Western civilizations. Besides, those from North America were mainly transported through Britain.

Naturally, some useful cultural manifestations and technologies remain in the newly seeded civilizations, although the technologies and cultures of indigenous people have mostly disappeared (for instance, in the West, cultivation, such as corn in North America, originally developed by indigenous people). In the case of Hokkaido, the cultures present amongst the Ainu built on a method of salmon fishing; this remains the modern style of fishing in Hokkaido. Regarding Factor 2, concerning the interaction with the ecosystem surrounding the civilization, the size and geological location of North America and Hokkaido are quite different. In addition, although both the civilizations are located in the middle latitudes,
Hokkaido is a relatively small island and a cool temperate zone, although North America is a continent with a huge area and several ecosystems, from frigid to subtropical. Thus, production and surplus by cultivation in these areas are different.

Regarding Factor 3, concerning the interactions with other civilizations and societies, Tokugawa rule curtailed Japan’s interaction with other countries in the early modern age. Hokkaido was an exception. In addition, Hokkaido is located adjacently, to the north of Japan, while North America is located far from Western European civilizations. Hokkaido is indeed a local municipality of Japan today. This fact implies that Hokkaido in Japan constitutes a symbiosis incorporated into the system of Japanese civilization.

Conclusions

1. The biosystematic view of civilization shows that the behaviors of civilizations can be evaluated from the three factors and stages of civilization. This view supports the fact that the formation of the New World for Western Europe and the incorporation of Hokkaido in Japan are parallel phenomena.

2. In determining the behavior of a civilization, the relationship between a civilization and other civilizations is more important than the relationship between the civilization and the environment after the Industrial Revolution.

3. The spontaneous formation of hierarchical levels is a system found in many civilizations and societies. This indicates that (a) multiple hierarchical levels and complicated interactions appear among the civilizations and societies while (b) it seems that the societies and civilizations are becoming a singular system.

Acknowledgment

I would like to thank Nobuhiro Uno at Hiroshima Shudo University and Noriko Konagaya at Yasuda Women’s University for valuable discussions.

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